# FIGURE 1A

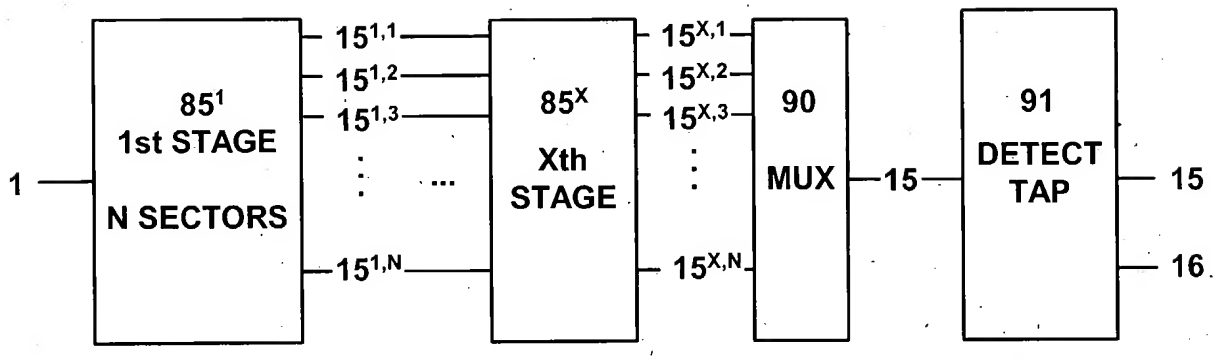

102
1
85^1
1st STAGE
N SECTORS
15^1,1
15^1,2
15^1,3
15^1,N
85^X
Xth
STAGE
15^X,1
15^X,2
15^X,3
15^X,N
90
MUX
15
91
DETECT
TAP
15
16

FIGURE 1B

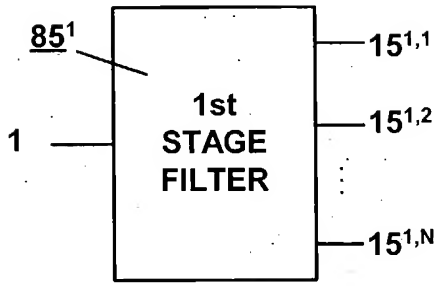
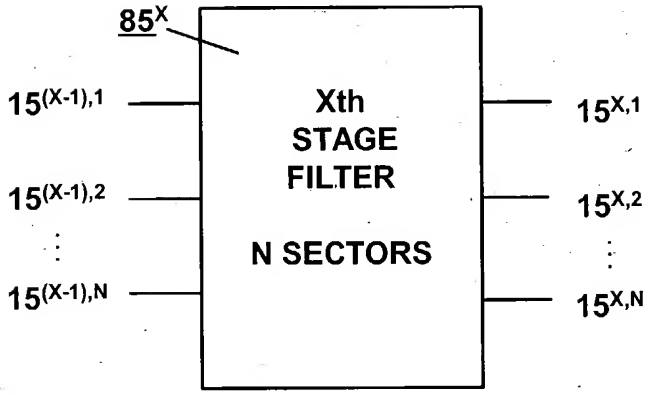
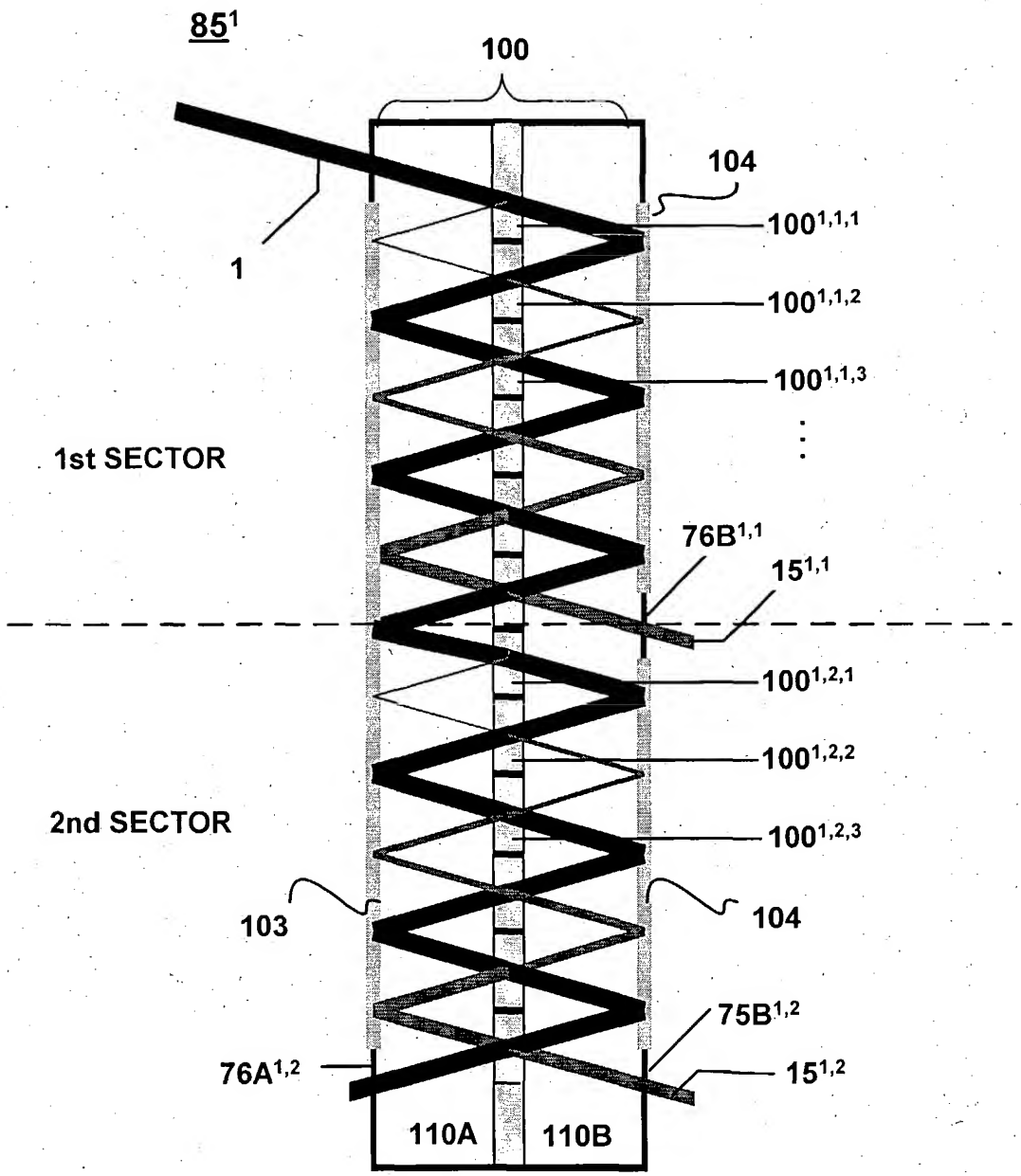


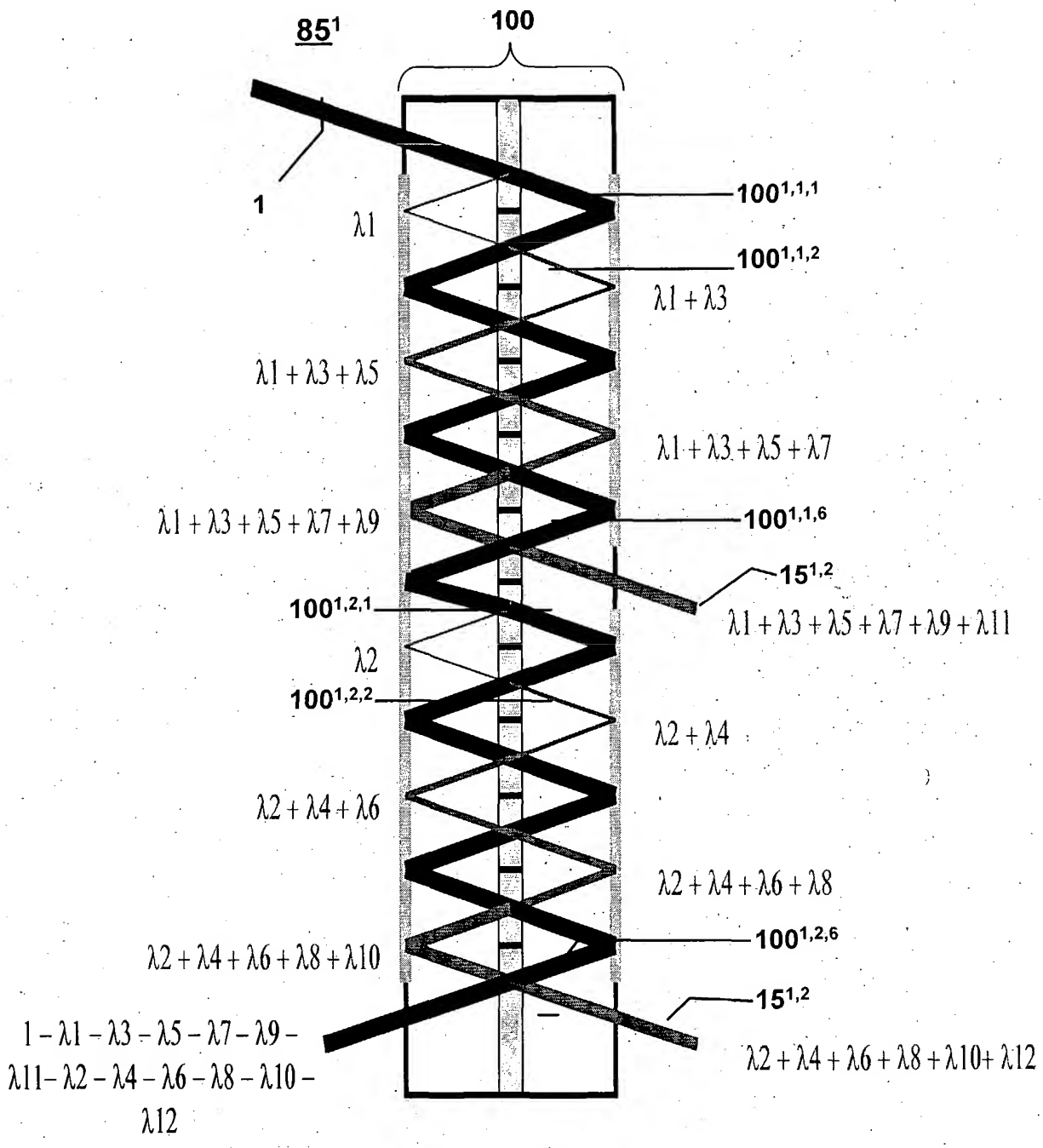

FIGURE 1C



# FIGURE 1D


85[1]
100
104
1
100[1,1,1]
100[1,1,2]
100[1,1,3]
1st SECTOR
76B[1,1]
15[1,1]
100[1,2,1]
100[1,2,2]
2nd SECTOR
100[1,2,3]
103
104
75B[1,2]
76A[1,2]
15[1,2]
110A
110B

# FIGURE 1E


85¹
100
1
λ1
100^1,1,1
100^1,1,2
λ1 + λ3
λ1 + λ3 + λ5
λ1 + λ3 + λ5 + λ7
λ1 + λ3 + λ5 + λ7 + λ9
100^1,1,6
15^1,2
λ1 + λ3 + λ5 + λ7 + λ9 + λ11
100^1,2,1
λ2
100^1,2,2
λ2 + λ4
λ2 + λ4 + λ6
λ2 + λ4 + λ6 + λ8
λ2 + λ4 + λ6 + λ8 + λ10
100^1,2,6
15^1,2
1 − λ1 − λ3 − λ5 − λ7 − λ9 − λ11 − λ2 − λ4 − λ6 − λ8 − λ10 − λ12
λ2 + λ4 + λ6 + λ8 + λ10 + λ12

# FIGURE 1F

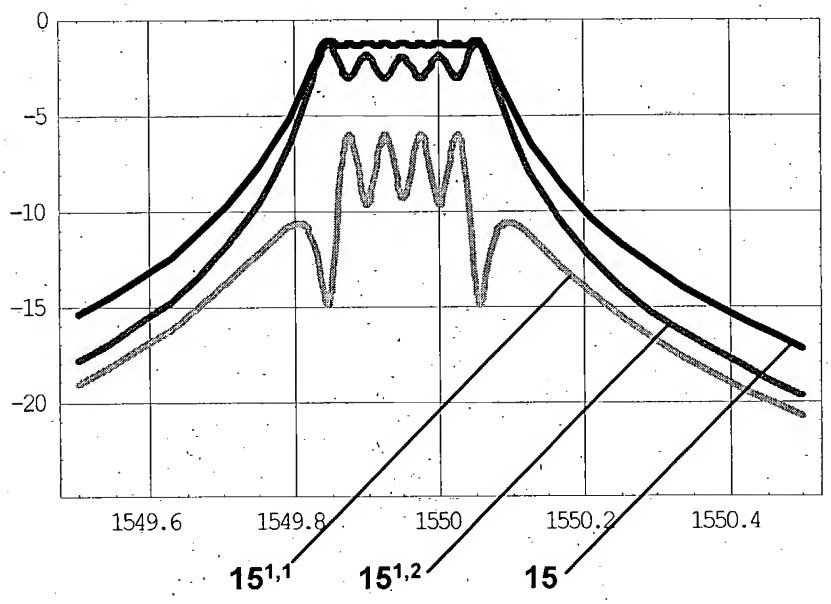


**FIGURE 2A**

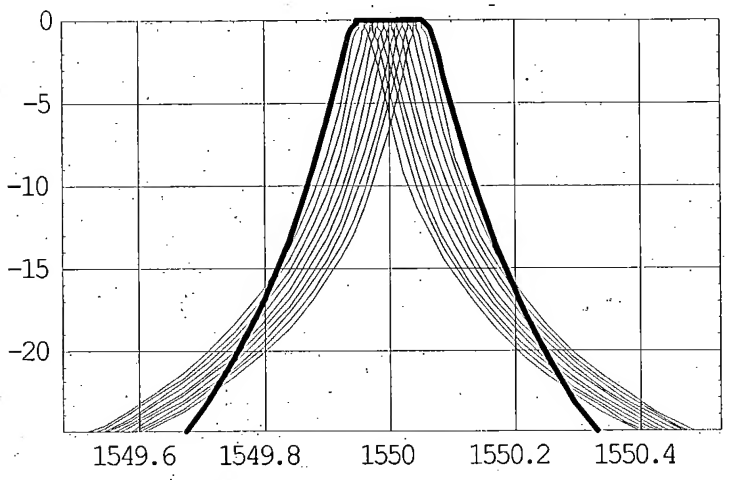
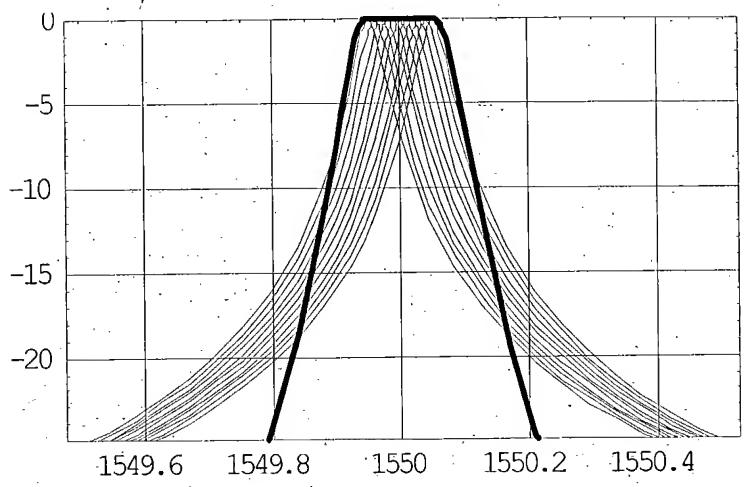
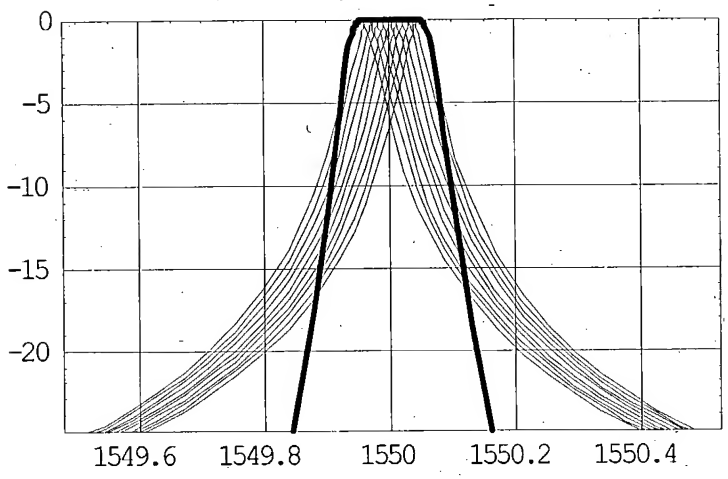


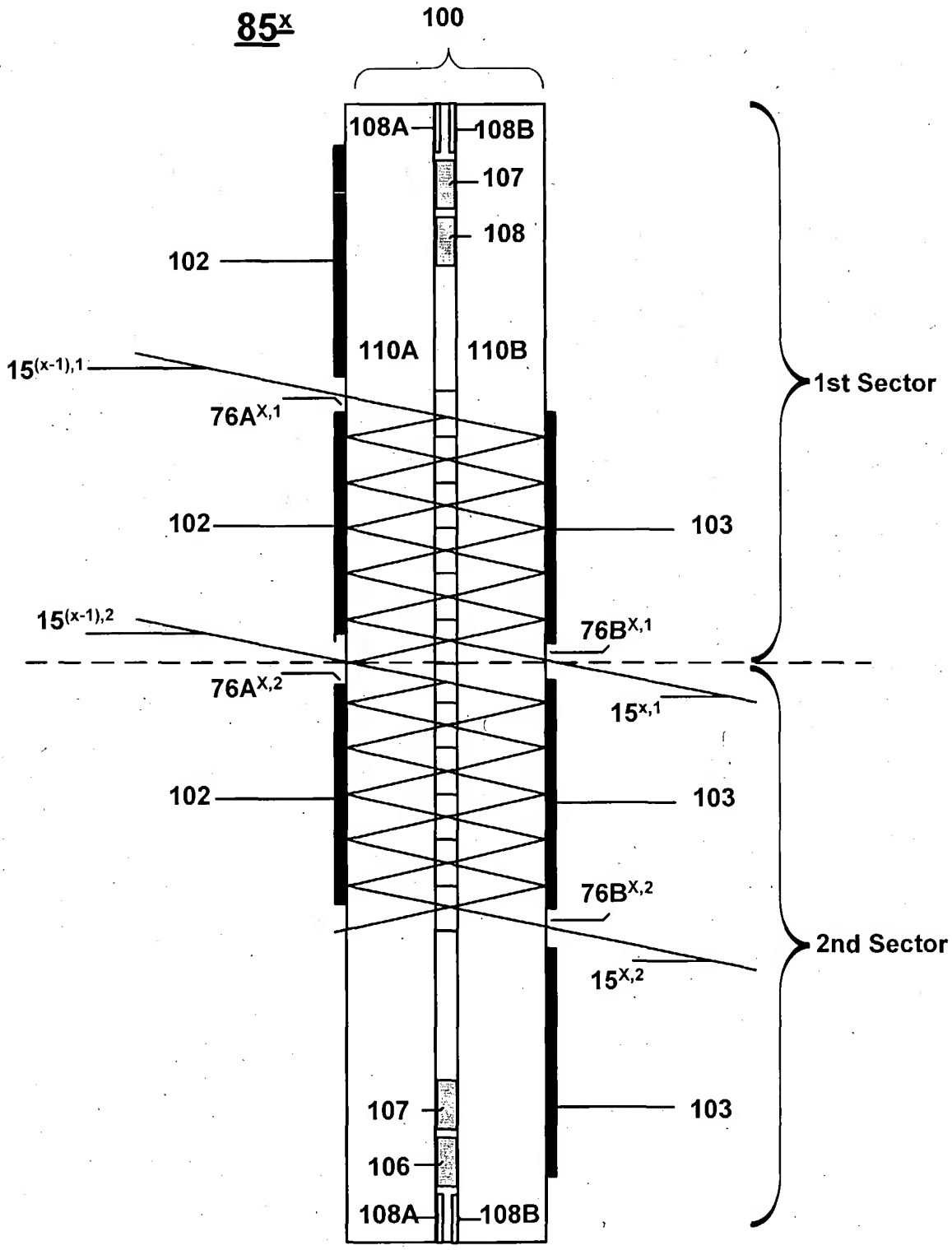
**FIGURE 2B**



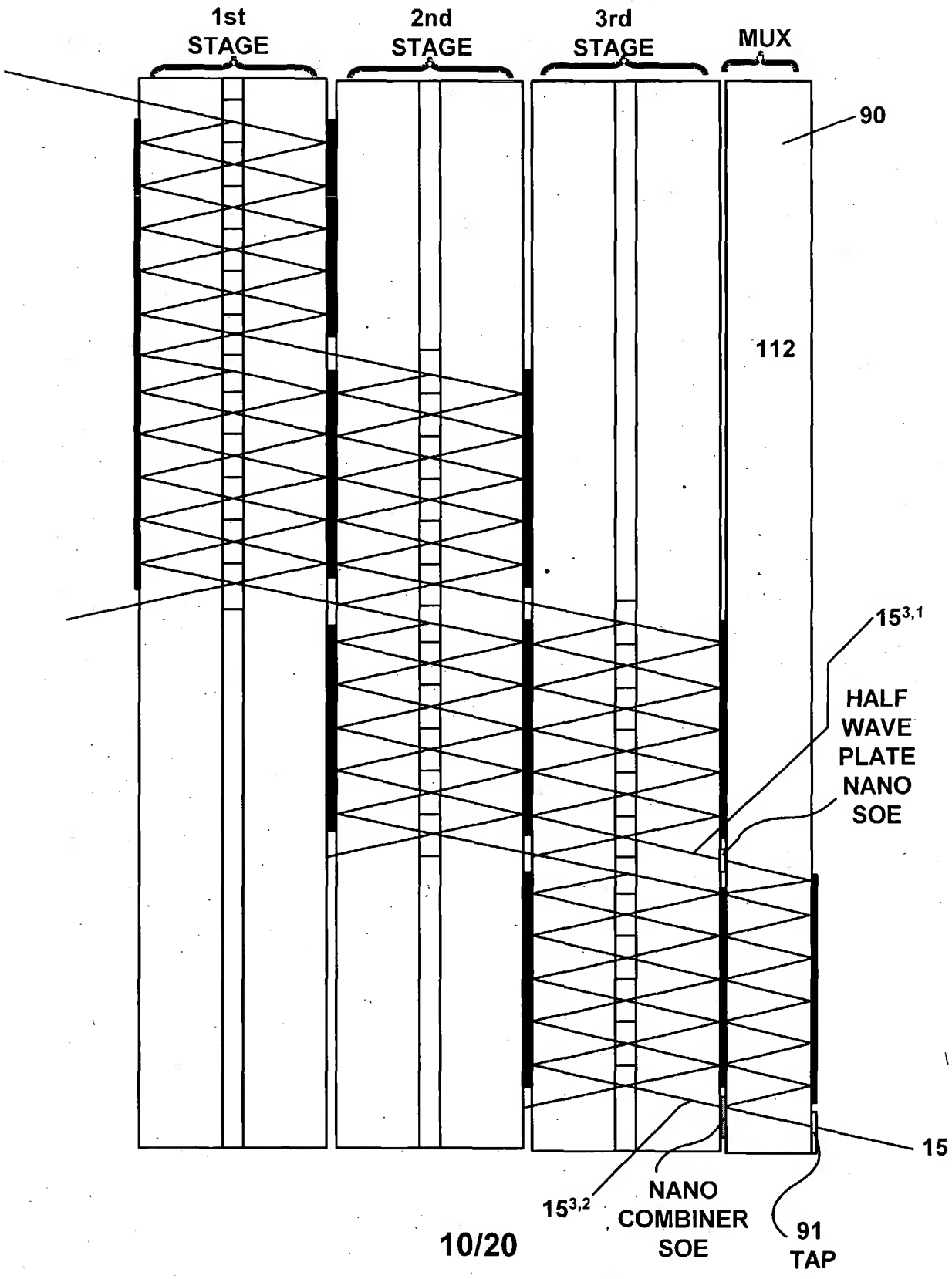
# FIGURE 2C



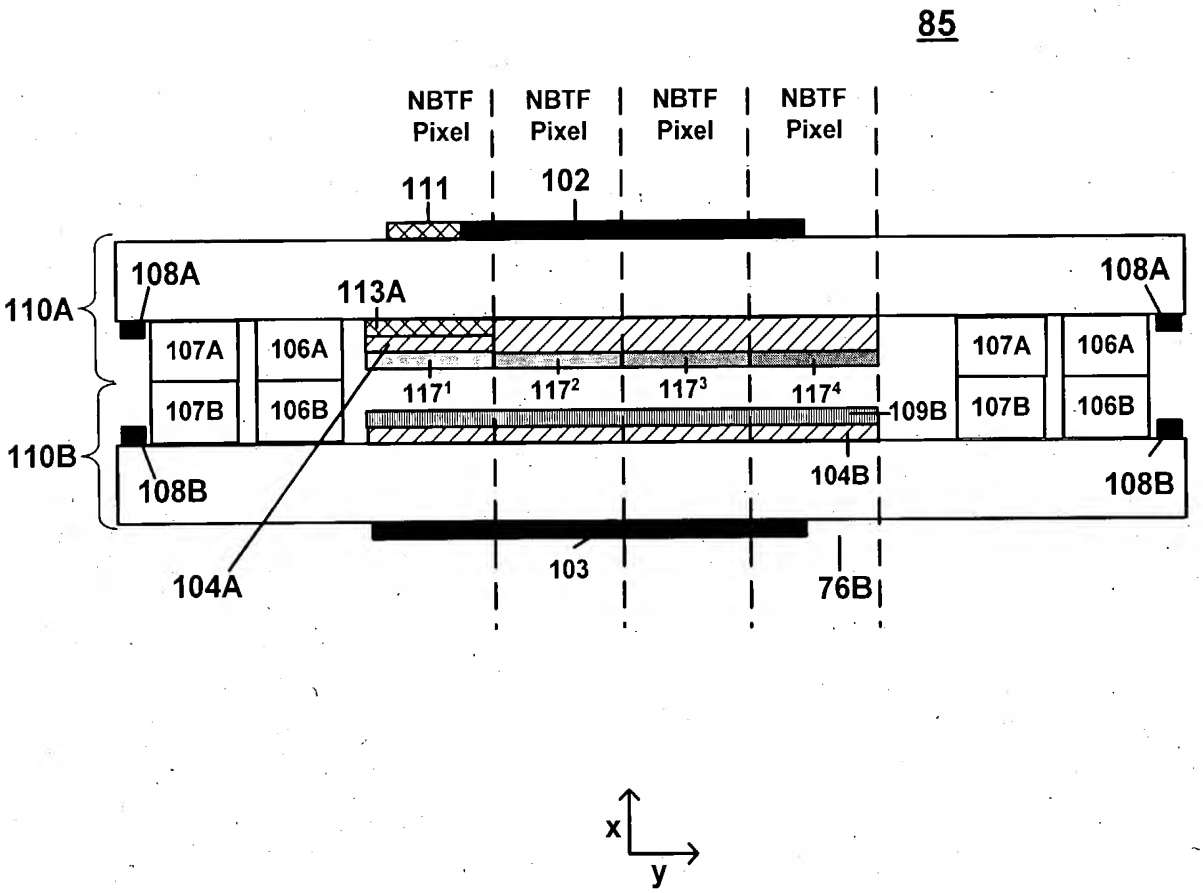
# FIGURE 3A


85^x
100
108A
108B
107
108
102
110A
110B
15^(x-1),1
76A^X,1
1st Sector
102
103
15^(x-1),2
76B^X,1
76A^X,2
15^x,1
102
103
76B^X,2
2nd Sector
15^X,2
107
103
106
108A
108B

# FIGURE 3B


1st STAGE
2nd STAGE
3rd STAGE
MUX
90
112
$15^{3,1}$
HALF WAVE PLATE NANO SOE
15
$15^{3,2}$
NANO COMBINER SOE
91 TAP

# FIGURE 4


85
NBTF Pixel
NBTF Pixel
NBTF Pixel
NBTF Pixel
111
102
108A
113A
108A
110A
107A
106A
107A
106A
107B
106B
117¹
117²
117³
117⁴
109B
107B
106B
110B
108B
104B
108B
104A
103
76B
x
y

# FIGURE 5

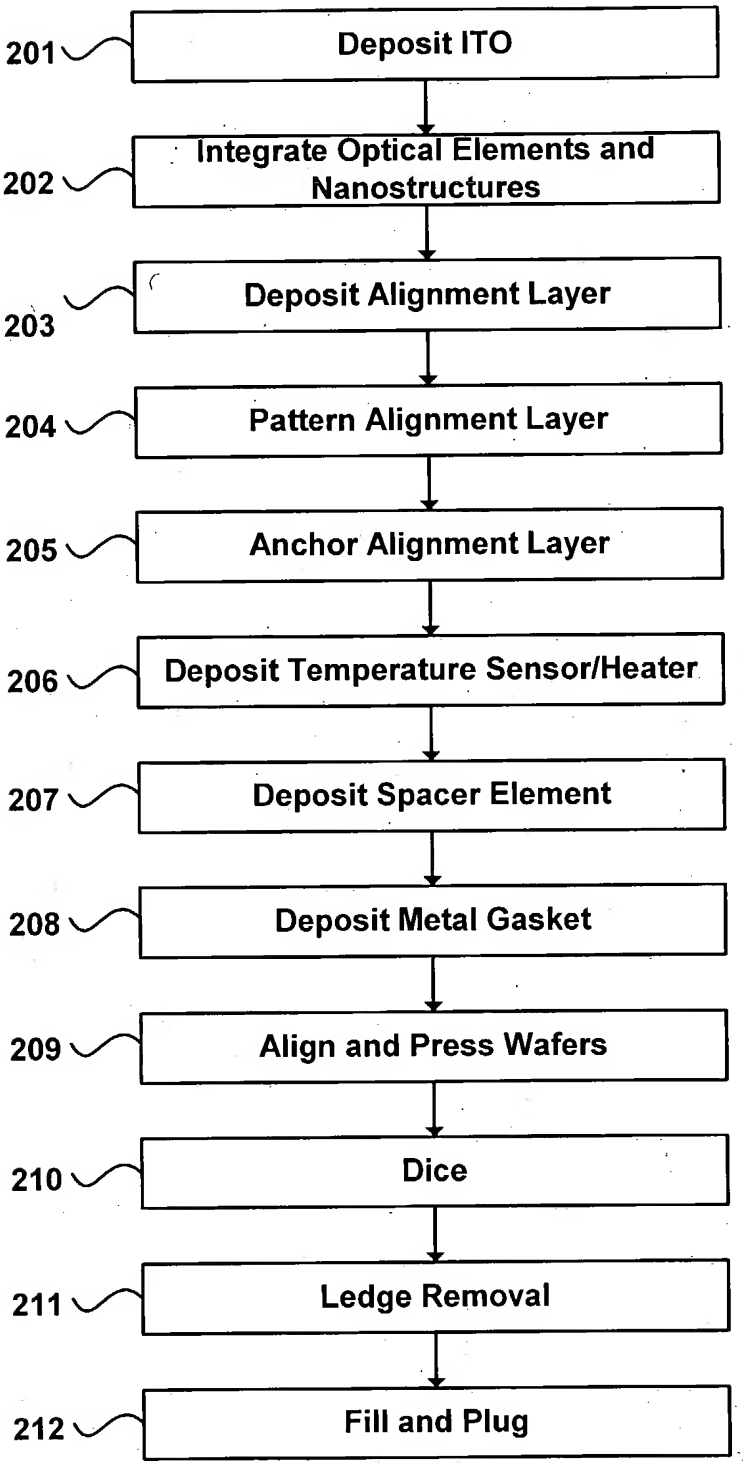

201
Deposit ITO
202
Integrate Optical Elements and Nanostructures
203
Deposit Alignment Layer
204
Pattern Alignment Layer
205
Anchor Alignment Layer
206
Deposit Temperature Sensor/Heater
207
Deposit Spacer Element
208
Deposit Metal Gasket
209
Align and Press Wafers
210
Dice
211
Ledge Removal
212
Fill and Plug

FIGURE 6A

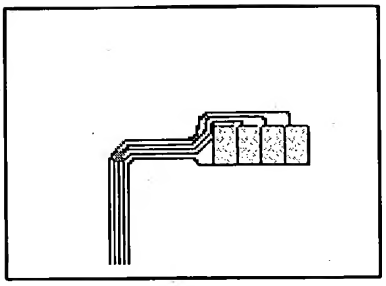


FIGURE 6B

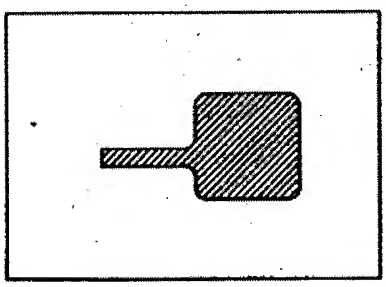


FIGURE 7A

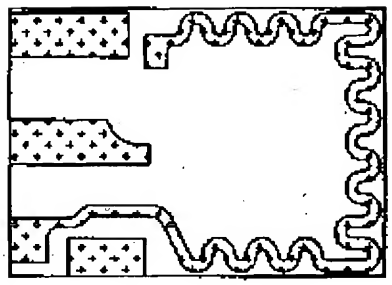


FIGURE 7B

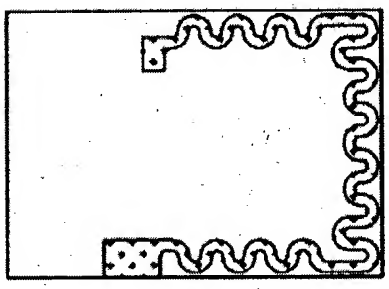


FIGURE 8A

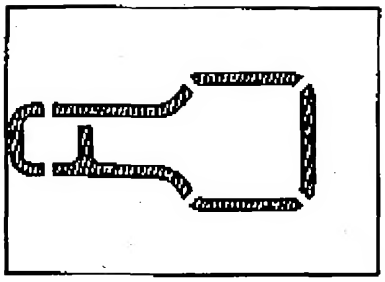


FIGURE 8B

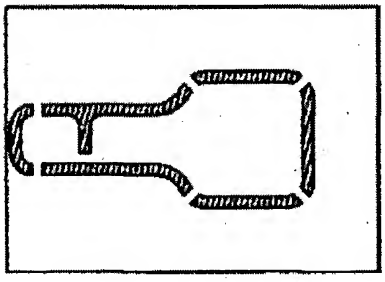


FIGURE 9A

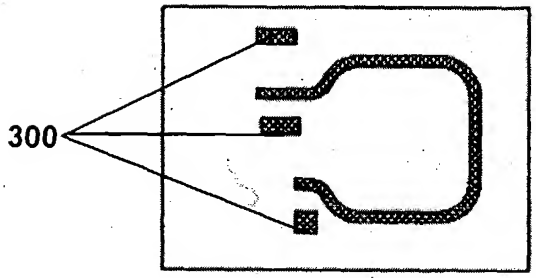



FIGURE 9B

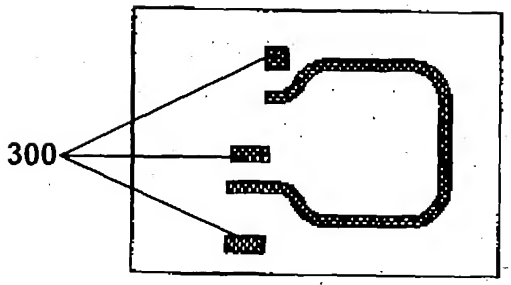
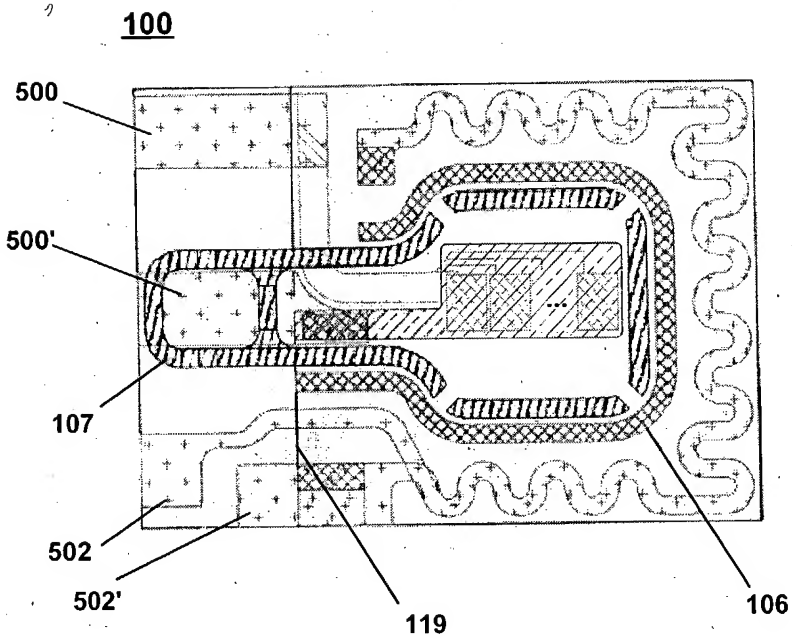
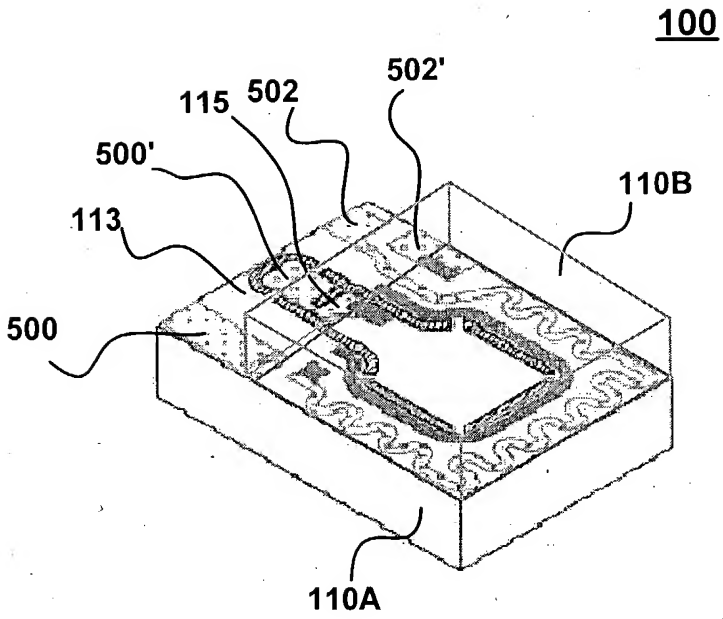


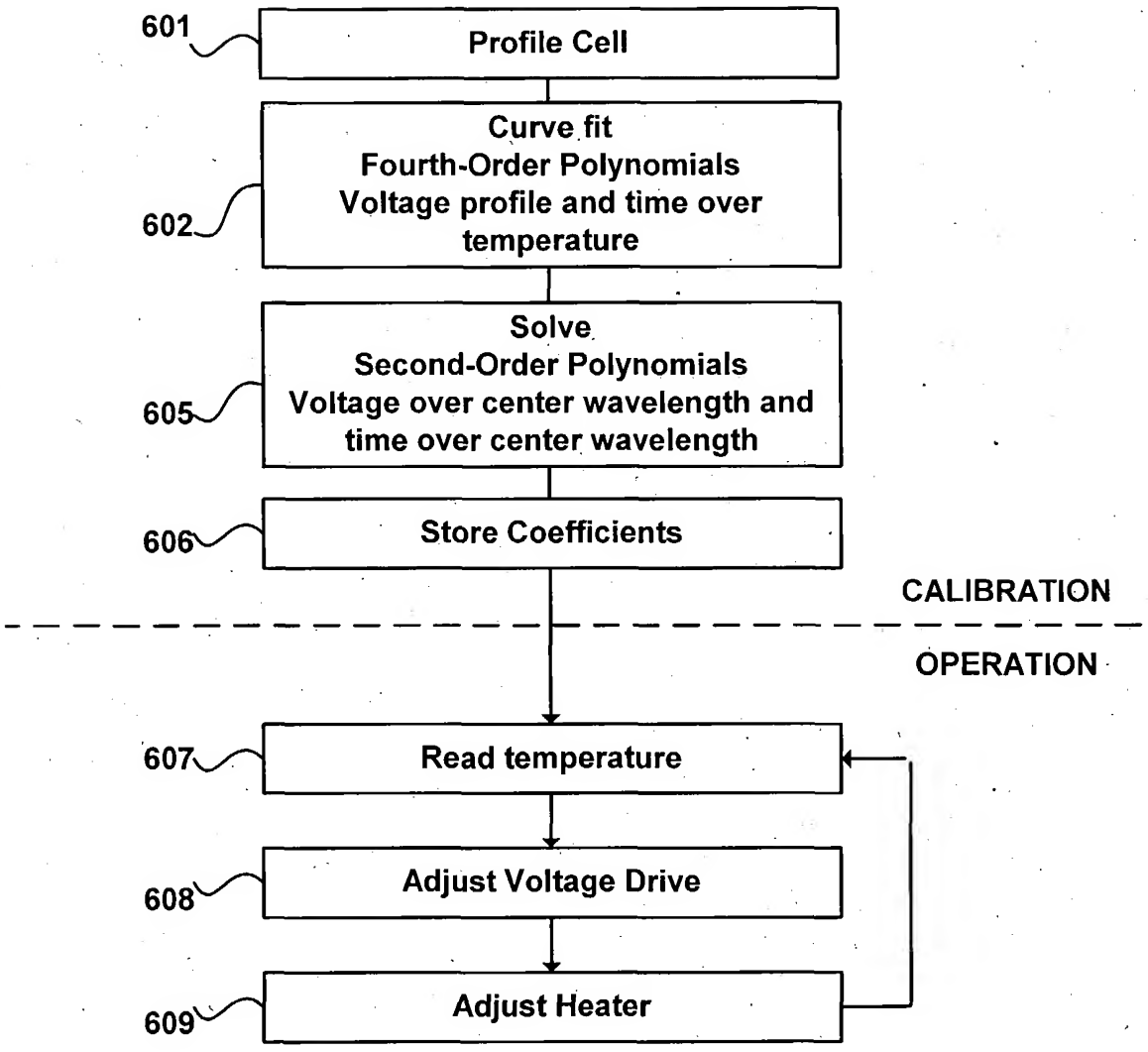
FIGURE 10A



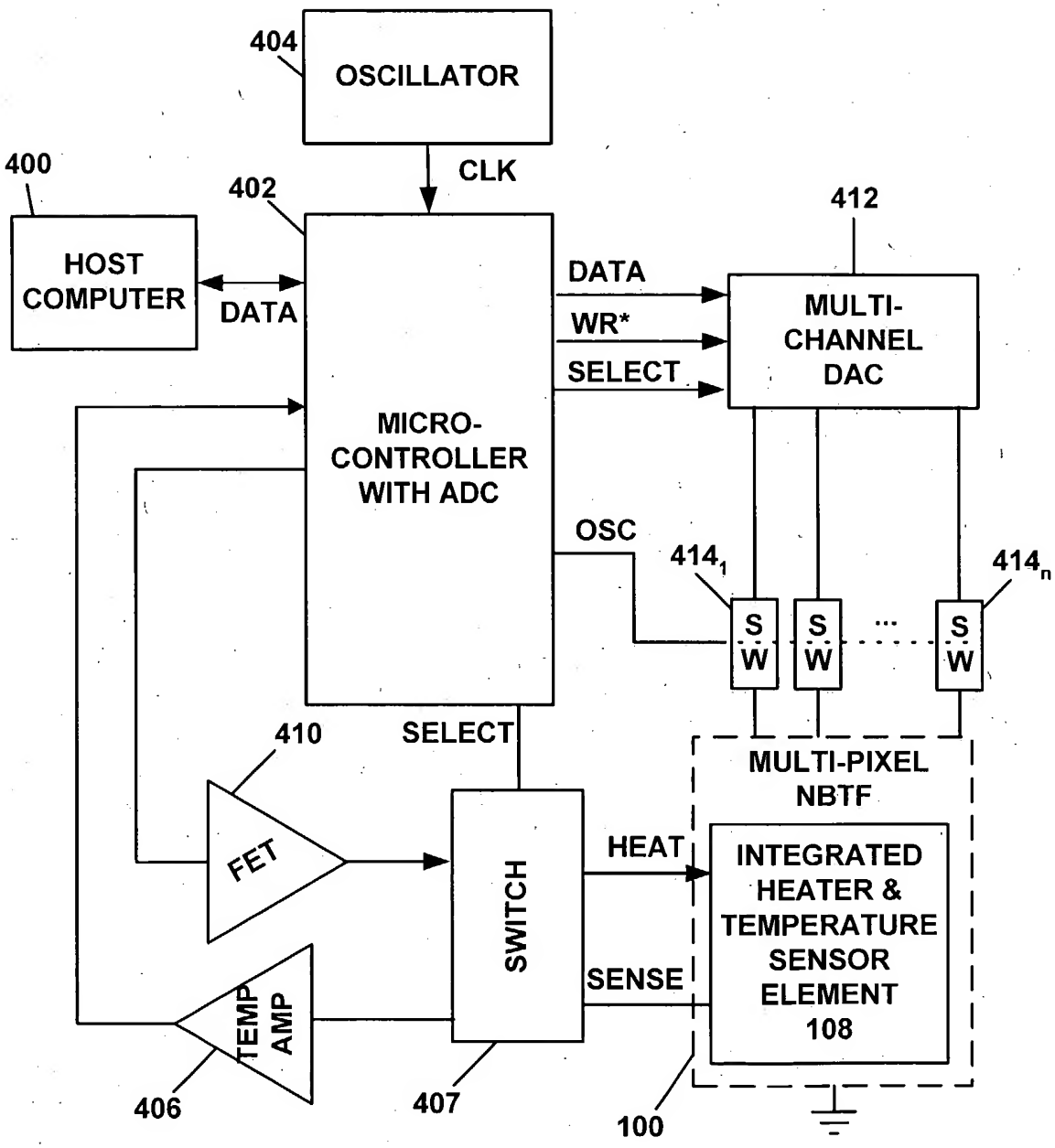
# FIGURE 10B



# FIGURE 11


601
Profile Cell
Curve fit
Fourth-Order Polynomials
Voltage profile and time over temperature
602
Solve
Second-Order Polynomials
Voltage over center wavelength and time over center wavelength
605
Store Coefficients
606
CALIBRATION
OPERATION
Read temperature
607
Adjust Voltage Drive
608
Adjust Heater
609

# FIGURE 12


404
OSCILLATOR
CLK
400
402
412
HOST COMPUTER
DATA
DATA
WR*
SELECT
MULTI-CHANNEL DAC
MICRO-CONTROLLER WITH ADC
OSC
414$_1$
414$_n$
S W
S W
...
S W
410
SELECT
MULTI-PIXEL NBTF
FET
SWITCH
HEAT
INTEGRATED HEATER & TEMPERATURE SENSOR ELEMENT 108
SENSE
TEMP AMP
406
407
100